



Avian influenza and human pandemic influenza

Summary report

Meeting held in Geneva, Switzerland
7–9 November 2005



Contents

2	An urgent agenda of universal relevance
3	Setting the stage: views from the agencies
9	Understanding the challenge
11	Immediate needs
17	Priority concerns
21	Guiding principles for taking action
23	Opportunities to intervene
25	Ways and means
27	Suggested concrete actions
29	Main conclusions and recommended actions
31	Agenda, list of participants

An urgent agenda of universal relevance

From 7 to 9 November 2005, the World Health Organization (WHO), the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (OIE), and the World Bank jointly convened a meeting on avian influenza and human pandemic influenza. The meeting, which was attended by more than 600 experts from over 100 countries, marked the largest gathering held to date to assess the multiple threats arising from outbreaks of highly pathogenic avian influenza, caused by the H5N1 virus, that have been ongoing in parts of the world since mid-2003.

The meeting was considered unique in the number of participants, the high level of government representation, and the co-sponsorship of four international agencies. For the first time, international and regional financial institutions were included to address economic issues and advise on mechanisms for funding priority interventions. Much was at stake, from the documented enormous consequences for agriculture and the livelihoods of millions of small farmers to the most pressing concern of all: mounting evidence that another influenza pandemic may be imminent. That prospect was described by participants variously as inevitable, in the cards, on the doorstep or, simply, expected by nearly everyone. Financial institutions were also asked to assess the potential social and economic impact of a pandemic under the unique conditions of the 21st century, and to advise on how that impact might be mitigated.

Discussions took place on well-prepared ground, preceded as they were by a series of high-level meetings that had raised political awareness and gathered consensus about the severity of the threat and the main lines of action needed. From that starting point, an agenda was set out to steer discussions towards agreement on concrete actions in line with the almost universal sense of urgency. That sense of urgency, in turn, was sharpened by the recent appearance of the virus in new countries, projections that further spread was almost certain, and an increase in reports of sporadic human cases. Presentations ranged in nature from appraisals of needs in countries presently fighting this disease, to proposals for developing early warning systems for areas considered at risk, to estimates of resources required to meet immediate and longer-term objectives.

Apart from taking stock of the current situation and related threats to human and animal health, the meeting aimed to make an inventory of precise needs, establish priorities, and map out ways to meet them. Mechanisms for matching those needs with rapid, adequate, and flexible funding were also explored. Discussions benefited from first-hand accounts from a diversity of countries either directly affected by outbreaks in birds and humans or considered to be at high risk. Expressions of need were open and candid. Several front-line countries frankly admitted their inability to deal with a disease of this nature on their own, despite full awareness of what failure could mean for the international community. Countries that had successfully controlled outbreaks of highly pathogenic avian influenza shared the lessons learnt and explained their relevance to the present situation. Those presentations helped give the shared sense of urgency a focus by defining specific needs and challenges. They also moved the discussion forward by suggesting concrete lines of action.

Setting the stage: views from the agencies

WHO: “incalculable human misery”

The meeting was opened by the Director-General of WHO, who pointed to a series of high-level meetings, held on three continents, that had helped solidify political engagement and build consensus on the issues of greatest mutual concern. Those meetings had created a truly global awareness of the importance of pandemic preparedness and the role of international cooperation in responding to a universally shared threat. The meetings had also built political consensus and shaped the agenda for discussion during the coming days.

He recalled the distinction between seasonal influenza, which caused yearly epidemics of usually mild respiratory disease, avian influenza, which was a severe disease almost exclusively affecting poultry, and pandemic influenza, which was yet to come. The signs, he noted, were clear that another pandemic was near at hand, although the timing could not be predicted with certainty. Based on experiences during past pandemics, such an event would cause incalculable human misery. As the SARS experience so vividly demonstrated, outbreaks of new infectious diseases in a closely interconnected and interdependent world could have major social, political, and economic consequences in addition to their heavy toll on human health. Unlike SARS, however, a pandemic would rapidly affect populations, social infrastructures, and economies in all countries, painting a grim picture for the whole world.

He identified four broad areas where discussions during the meeting could help identify the best actions and interventions. First, ways needed to be found to prevent and contain the spread of the highly pathogenic H5N1 virus among birds and from birds to humans. Second, countries needed to be better equipped to detect cases in both humans and birds, confirm the diagnosis, and report the findings. Here, prompt and transparent sharing of information was important, as was compensation to farmers for lost birds. Third, research and development were urgently needed to address the problem of inadequate supplies of vaccines and antiviral drugs. A related need was for an operational plan for the rapid deployment of antiviral drugs following the first signs of improved transmissibility among humans. Finally, the importance of risk communication to all societies and preparedness plans in every country should be kept in mind throughout the discussions. Strategies for ensuring business and societal continuity should be part of these plans.

Above all, interventions and actions put forward in the coming days should meet urgent needs in the present emergency, but also contribute to the longer-term goal of strengthening national, regional, and global capacity for public health.

WHO: the operational response – now and during a pandemic

A second WHO presentation provided an assessment of the pandemic threat and described requirements and capacities for mounting an adequate response. The risk of a pandemic was considered great and likely to persist. In humans, the H5N1 virus caused severe disseminated disease affecting multiple organs and systems; more than half of those infected had died. As no virus of the H5 subtype had ever circulated widely among humans, vulnerability to a pandemic caused by such a virus would be universal.

The world had received an unprecedented warning that a pandemic could be imminent, and had been given an equally unprecedented opportunity to prepare.

That opportunity could also be used to make fundamental improvements in national and international systems for dealing with all epidemic-prone infectious diseases. WHO had, in the past decade, developed systems, networks, and partnerships to operate as early warning systems and provide a rapid and coordinated response. That strengthened capacity was supported by a clear mandate, a decentralized emergency response capacity, and considerable experience in outbreak investigation and containment. By drawing on institutions linked together in the Global Outbreak Alert and Response Network (GOARN), WHO could deploy the world's best experts to an outbreak site within 24 hours. It should, however, be remembered that past pandemics had shaped human history; the magnitude of a pandemic would dwarf experiences during the control of localized outbreaks or outbreaks with limited international spread.

In addition to its alert and response networks, WHO had been conducting global influenza surveillance since 1947 through a network of specialized influenza laboratories. Apart from maintaining constant monitoring of circulating influenza viruses throughout the world and vigilance for novel subtypes and strains, laboratories in the network were providing critical diagnostic and analytical support to countries affected by the current outbreaks. All of those networks and mechanisms would underpin WHO's operational support during a pandemic.

WHO identified five priority actions for the international community:

1. Reduce human exposure to the H5N1 virus. While the virus continued to circulate in poultry populations, reduced human exposure could be achieved through education, compensation of farmers, and communication of high-risk behaviours to avoid.
2. Strengthen the early warning system. Capacity needed to be in place to detect, investigate, and immediately report every human case. Reliable information about the epidemiology of the disease allowed WHO to issue an accurate level of pandemic alert. Unfortunately, both veterinary and health surveillance systems were weak in some of the most critically affected countries.
3. Intensify rapid containment operations. Successful containment, of both sporadic human cases and clusters of cases suggesting improved transmissibility, depended on prompt and thorough field investigations, proper case management, the tracing and monitoring of contacts, and the protection of health care workers. Rapid containment, using the WHO stockpile of antiviral drugs, would be especially important following the first signs that the virus was spreading efficiently among humans.
4. Build coping capacity. By their very nature, influenza pandemics spread rapidly to affect all parts of the world. All countries needed preparedness plans. The characteristics of a pandemic, and the best control measures for responding to it, could not be known until after the new virus emerges. WHO would need the full support of the international scientific and medical communities as it monitored, in real time, the evolution of the pandemic and translated that emerging knowledge into pragmatic advice on control. That information would help ensure that resources, which would be strained everywhere, were invested in measures having the greatest likelihood of success.
5. Coordinate global research, including accelerated development of pandemic vaccines and expanded production capacity. Vaccines were the first line of defence for reducing morbidity and mortality during a pandemic. Research was urgently needed to improve world capacity to produce and deliver a pandemic vaccine to large numbers of people in a timely manner. That might be the greatest challenge facing the international community as it prepared for a pandemic.

FAO: reduce the pandemic risk at its source

At present, H5N1 avian influenza was mainly a disease of animals. FAO had three main messages to convey. First, control of the core problem – the continuing circulation of the virus in poultry – was the best way to reduce the risk that a pandemic virus might emerge. Second, the window of opportunity for doing so remained open. Third, there were no technical barriers to achieving that goal.

A strategy for the progressive control of highly pathogenic avian influenza was available, as were internationally agreed norms and standards. The principal challenge was to equip affected and at-risk countries to comply with those guidelines and standards. Successful control would depend on political commitment, substantial investments, international cooperation, and intense action on the part of affected and at-risk countries.

The devastating consequences of the outbreaks in poultry were briefly described. In Asia, an estimated 150 million chickens and ducks had died or been destroyed. The economic costs had gone far beyond an estimated US\$ 10 billion, and those costs were being felt most acutely by the approximately 200 million small farmers whose livelihoods had been heavily affected.

The present crisis had its roots in the dynamics of world poultry and bird ecology which, in turn, had been placed under pressure by an exponentially increasing demand for protein of animal origin. The recent spread of the virus beyond the initial epicentre in South-east Asia provided evidence that migratory birds had developed a capacity to carry the virus over long distances, causing genuine concern that worldwide spread in birds might occur. No poultry-producing country should consider itself safe.

If prudent measures were taken immediately, on the appropriate scale and with adequate financial and technical assistance, the disease could be stopped in its tracks at source. A three-pronged approach for doing so was outlined. That approach was being followed by FAO in collaboration with OIE and other partners.

1. Work directly with affected and at-risk countries. That – the most important activity – was being undertaken to strengthen veterinary services and capacities to detect and report the disease and implement recommended control measures. Measures of demonstrated immediate efficacy included good farm hygiene, appropriate use of quality-assured vaccines, and rapid culling; assistance in implementing all those measures was being provided. For the longer term, a fundamental restructuring of farming systems, to provide separate rearing of species, should be considered.
2. Establish mechanisms for regional networking and information sharing. Regional networks have been put in place as a formal mechanism for exchanging information and lessons learnt during control efforts. As the disease had a complex and changing epidemiology, other mechanisms had been established to foster the sharing of epidemiological data and of virus samples with laboratories in networks maintained by the international agencies.
3. Provide technical information for awareness and advocacy. Technical information was being provided, in real time, for use in risk assessment, risk communication, and early warning messages. The immediate availability of technical information had also proved useful in sounding the alarm, gathering support, and mobilizing action.

The effectiveness of that approach could be improved through research, aimed at producing better vaccines and diagnostic tests and at understanding the altered role of migratory birds, and through much greater financial support.

OIE: address emerging and re-emerging threats from animals

OIE provided an overview of the global situation and issued a series of proposals, at both the conceptual and operational levels, for addressing the present crisis. Those proposals pertained not only to H5N1 avian influenza, but to other emerging and re-emerging diseases from the animal world.

H5N1 was described as a multi-host virus that could evolve very quickly. Although avian influenza viruses were common and have been well-known for some time, the pathogenicity index was important in understanding their significance. Viruses of the H5 and H7 subtypes had the greatest potential to evolve to highly pathogenic forms. Viewed against those general characteristics, the highly pathogenic H5N1 virus had revealed some unique characteristics, the most recent of which was its ability to infect wild birds and be carried and transmitted by them. To date, the virus had demonstrated little capacity to infect pigs. It had, however, crossed the species barrier to infect humans, although that was not happening easily, to date. Further international spread of the virus could occur along the routes taken by wild migratory birds, or through the more conventional routes involving international trade and movement of animals, commodities, and people.

Already, the outbreaks in poultry had caused great social and economic harm, and could be deepening poverty in rural areas. Apart from the direct loss of tens of millions of domestic birds, and the corresponding impact on millions of small farmers, the outbreaks had caused a drop in poultry and egg consumption in several countries, resulting in lost jobs. Concerns about a possible pandemic could result in a shift of public resources away from the core problem, which resided in the animal sector. In that regard, it should be remembered that the probability of a pandemic was directly linked to the virus load circulating in animals.

A major effort to combat the outbreaks in poultry was regarded as fully justified on many fronts; doing so should be regarded as an international public good. Solutions to the present crisis pertained to a large number of other emerging diseases, as conditions that fostered the emergence of new pathogens had similar root causes. Nearly all new diseases affecting humans originate from an animal reservoir. Some 60% of human pathogens were zoonotic, as were 75% of emerging diseases. Measures taken to build capacity for coping with avian influenza would strengthen defences for coping with many other pathogens of both human and animal importance.

Additional proposed concepts for addressing the present situation included good governance, supported by legislation in the veterinary sector. Relevant infrastructures and veterinary services were a prerequisite for implementing legislation. Equally central to success were systems for early detection and rapid response, transparent reporting which adhered to agreements for the notification of priority diseases, and compliance with international norms and standards. Many standards specific to avian influenza already existed; those covered international trade, evaluation and audit, surveillance, diagnostic methods, and vaccine quality.

World Bank: economic and social dimensions of the problem

An analysis of costs, benefits, and incentives could help frame effective strategies. Avian influenza had both immediate and long-term economic and social consequences. The immediate costs, both direct and indirect, were being felt most acutely in the animal sector, and are presently concentrated in rural parts of South-east Asian countries. To date, no significant losses had arisen from a decrease in tourism to affected countries, but that could come as worldwide concern intensified. Although costs to date had been fairly limited at the macroeconomic level, they would climb enormously on a world scale should a pandemic begin.

Direct costs had arisen from losses of poultry, with both upstream costs to farming and downstream costs to related sectors, such as poultry traders, feed mills, and breeding farms. The most severe impact to date had occurred in Thailand and Viet Nam; those countries had lost from 15% to 20% of their poultry stock. Direct costs of prevention and control in animals had arisen from vaccination, culling and clean-up, including safe burial and farm disinfection. That impact had been heaviest on individual rural households, and it had been only partly offset by government compensation schemes. Compensation was especially important, as it helped persuade farmers not to conceal outbreaks. Adverse distributional effects were also occurring: in Viet Nam, household surveillance data had shown that the poorest quintile of households relied more than 3 times as much on income from poultry than did the richest quintile. In countries like Thailand and Indonesia, where industrial and large-scale production were important, the economic impact had also been felt in greater unemployment, lost profits, and corporate bankruptcies.

A human pandemic was, however, the central concern in terms of economic and social impact. WHO had estimated that, based on the scenario of a mild pandemic, mortality could range from 2 million to 7.4 million deaths worldwide. Under a pandemic situation, the most immediate economic impact might arise, not from the number of cases and deaths, but from uncoordinated efforts of the general public to avoid becoming infected. The likely result would be both a “demand shock” for service sectors, such as tourism and mass travel, and a “supply shock” due to workplace absenteeism, disruption of production processes, and shifts to more costly procedures. In addition, emergency measures, such as quarantines and restrictions on travel and trade, could add to the economic disruption and increase its costs. A significant loss of world output could arise from a reduction in the size and productivity of the world labour force due to illness and death. Further losses would come from the costs of hospitalization and medical treatment. Although reliable estimates were difficult to compile, the economic consequences of a pandemic could amount to global losses of around US\$ 800 billion within a year. The Asian Development Bank, too, had predicted a very large economic impact.

Five main policy issues, lessons, and questions needing study were identified.

1. Governments needed to establish a track record of credibility through honest, accurate and timely disclosure of information to their citizens and the outside world. During the 1918 pandemic, evidence suggested that economic costs had been magnified in a situation where governments were reluctant to accurately report on severity for fear of its impact on wartime public morale. In reality, that position had fuelled international spread of the disease and fostered social chaos.
2. Because animal and human health were closely linked in the present situation, country responses needed to draw on cross-sectoral plans in line with technical guidelines and standards from relevant international agencies. Integrated plans

- should unite all relevant government sectors under political leadership at the highest level.
3. Experiences from the use of different control strategies needed to be evaluated and compared – in cross-country exercises – in order to determine their relative efficacy. Some examples cited were culling, vaccination of poultry, and compensation schemes for farmers.
 4. Short- and long-term measures needed to be balanced. Problems caused by the endemicity of H5N1 avian influenza in parts of Asia were immediate; a pandemic was a far greater but less certain eventuality. In the present situation, both short- and long-term needs were best met through measures that strengthened the surveillance, institutional, regulatory, and technical capacity of animal, public health, and other relevant sectors.
 5. A final critical question, partly grounded in economics and important at the international level, concerned how best to foster research and innovation for the development of vaccines and antiviral drugs, and to expand production capacity and accessibility. Economists had developed many creative new ideas for achieving these objectives, and these now needed to move from the drawing board to prototype forms.

Understanding the challenge

Solidarity before a shared – and complex – threat

From the outset, participants acknowledged that they were dealing with an unusually complex problem with multiple dimensions, under pressure from a threat that could escalate rapidly and dramatically, yet in unpredictable ways. The severity of the threat and its relevance to every country in the world were appreciated by all, as was the need to seal off all possible opportunities for the virus to improve its pandemic potential. That appreciation gave the discussions an edge of urgency, expressed as a shared determination to map out concrete solutions – and find the money to support them – now. Although some issues raised required clarification and others were deeply disturbing, there was no disagreement on the need for global solidarity before a shared threat of great magnitude. The multiple dimensions of the problem clearly called for coordinated, multisectoral, and integrated approaches within countries and regions. The universal nature of the pandemic threat made international collaboration, possibly to an unprecedented degree, both essential and sensible. The urgency called for departures from conventional approaches – whether for the approval of funding proposals or the acceptance of market forces as the driver of vaccine manufacturing capacity. Anything that could be done immediately should be undertaken without delay. Examples cited included the prequalification of vaccine manufacturers and immediate voluntary compliance with relevant provisions in the revised *International Health Regulations* (2005).

As many participants noted, pandemic influenza was a threat with scientific, technical, political, social, economic, agricultural, and health dimensions as well as implications for national and global security. A pandemic would challenge all parts of society, and call on governments to leverage all instruments of national power. Countries would also need to leverage their individual strengths as part of the international collaborative effort. During the meeting, a large number of countries expressed their desire to collaborate with the international community according to their unique assets and best abilities, and many concrete offers of assistance – in training, diagnostic work, the sharing of staff and experiences, and the donation of funds of various amounts – were received from developing as well as industrialized countries. Those offers of concrete support sent strong signals of commitment, engagement, and solidarity within the international community.

While the threat was intricate and posed many difficult challenges, emerging diseases of humans and animals were not new events; mechanisms and infrastructures for addressing these threats existed in nearly all parts of the world. International networks, such as the WHO Global Outbreak Alert and Response Network, likewise already existed and had considerable experience in providing rapid-response teams to assist those countries lacking adequate domestic capacity. While no single existing system was able fully to respond to either the present unprecedented crisis in poultry or the magnitude of world needs during a pandemic, all agreed that it was wiser to build on tried and tested systems than to create new ones from scratch.

A treacherous and tenacious virus

Against that positive background of consensus, solidarity, and determination, some of the news coming from countries, regions, and agencies was disturbing. The outbreaks in poultry had already brought economic losses to the agricultural sector

in excess of US\$ 10 billion in Asia alone. One European country, affected by small, circumscribed outbreaks in birds, had invested almost US\$ 6 million in control measures within a month. The World Bank estimated that the next pandemic might cost the world economy US\$ 800 billion within a year.

The H5N1 virus had shown itself to be a treacherous foe for humans and a tenacious one for poultry. Although the virus was not, at present, crossing easily from birds to humans, it caused extremely severe disseminated disease and killed more than half of the people it infected. In poultry populations, the virus could spread widely within 48 hours. If allowed to circulate unchecked, it could gain a permanent foothold, establishing itself as an endemic threat. Time and time again, countries on the verge of announcing freedom from the disease, following heroic control efforts, had experienced setbacks as fresh outbreaks occurred and rapidly spread to new areas. Moreover, the virus had established its strongest foothold in small backyard flocks in rural and periurban areas, where control was most difficult, opportunities for human exposure were greatest, and most human cases had occurred to date.

Weaknesses revealed

Some countries frankly admitted that prompt and transparent reporting of the disease situation was beyond their reach, as they had no surveillance systems with sufficient sensitivity and reach to pick up outbreaks in poultry or distinguish H5N1 infection in humans from the multiple other severe diseases with similar early symptoms. A few affected countries had shown a deliberate reluctance, often for economic and political reasons, to report animal outbreaks and human cases promptly and transparently. Management tended to be driven by the crisis at hand rather than by results-based planning. Mechanisms for genuine collaboration between public health and the agricultural sector were proving difficult to forge. Sharing of patient samples and viruses with the international community was limited in some cases and slow in others. Information to the public, particularly concerning risk communication, had not succeeded in achieving adequate public understanding of the issues in line with the level of risk, resulting in a panicked overreaction in some countries and the perpetuation of high-risk behaviours in others. Human cases were still being linked to behaviours that could have been avoided.

Although internationally agreed standards and guidelines were available, animal vaccines were not always produced according to acceptable quality standards or used in recommended ways. No vaccine was available to protect humans from H5N1 infection and most human cases were still being detected and hospitalized too late for antiviral drugs to be effective in improving patient prospects of survival.

A rapidly evolving virus

On the animal front, domestic ducks had become a “silent” reservoir of the virus; those birds were presently able to excrete large quantities of highly pathogenic virus without showing obvious signs of illness. The altered role of domestic ducks had greatly complicated control efforts while also removing the “warning signal” that could alert farmers and their households to the need to avoid high-risk behaviours. The role of wild migratory waterfowl – birds that had carried all influenza A viruses, with no apparent harm, probably for centuries – appeared to have changed. Evidence was mounting that at least some species of migratory birds were currently harbouring the H5N1 virus in its highly pathogenic form, transporting it over long distances, and transmitting it to other birds. Spread of the virus to further new areas was considered virtually inevitable.

Immediate needs

Although concern about the pandemic threat gave the meeting its urgency, much of the initial discussion focused on the current grave situation in animals. What assistance did countries need to control their outbreaks in poultry? Was the virus likely to spread further? What could be done to prevent it from establishing a permanent foothold in yet more geographical areas?

Those questions received some answers during presentations from virtually all countries affected by the current outbreaks. Although the picture that emerged was not an encouraging one, some countries could report successful control of outbreaks caused by H5N1 and other highly pathogenic avian influenza viruses. The costs, however, had been considerable; rapid detection and introduction of control measures, and support from a strong veterinary infrastructure, had been decisive.

Fighting an endemic threat

As noted by the World Bank, Viet Nam and Thailand had suffered the most in terms of losses to domestic poultry stocks. Those countries had also experienced the largest number of human cases, pointing to the well-known link between the virus load in birds and the likelihood of human infections. Both countries had already struggled against that disease for two years, with no immediate end in sight.

As the hardest hit country in terms of human cases of avian influenza, Viet Nam described what it had learnt from fighting that disease in poultry and humans. The virus was persistent. The country had experienced two peak waves of outbreaks in poultry, each accompanied by human cases. Despite the culling of more than 45 million birds in the first wave, the disease had returned a few months later, illustrating the difficulty of achieving control once the virus had established a foothold. Human cases had been detected in more than one third of the country's 64 provinces. Virus activity peaked during the winter months. Domestic ducks were acting as a healthy reservoir of the virus, and most outbreaks were occurring in backyard flocks. "Hot spots" of disease transmission in poultry were known to occur in rice paddy land which had dense networks of rivers and canals – home to large numbers of domestic ducks – and numerous backyard flocks. Effective control was difficult in such a situation.

The country reported some evidence that currently circulating viruses might be more infectious for humans. Most human cases continued to be linked to direct exposure to diseased poultry. Some family clusters had been detected, but there was no evidence of efficient human-to-human transmission. The government was committed to transparent reporting and ongoing control efforts. Those aimed to prevent the recurrence of outbreaks in poultry, minimize the risk of human infections, and reduce opportunities for a pandemic virus to emerge. In 2005, a large-scale vaccination campaign, targeted to reach 150 million birds, had been launched; already, some 80 million poultry had been vaccinated. Public awareness campaigns, using the media, had also been launched, and those were reaching the grassroots level. However, adequate public awareness remained a major challenge.

Like other affected countries, Viet Nam had weak infrastructures, and those had been strained by the added burden of avian influenza. International support to date was acknowledged with gratitude, but more support was needed. Specific needs –

shared by many other Asian countries – were for surveillance and monitoring in rural areas, upgrading of veterinary and human diagnostic capacity, compensation for farmers, and investigations at borders and in live markets. Hospitals, too, needed to be better equipped to manage patients and prevent nosocomial transmission. Other needs included a fundamental restructuring of farming and market systems, and support for the mass vaccination campaign in poultry, which would have costs estimated at more than US\$ 15 million.

Experiences in Thailand were similar. Possibly, no other country had tried so hard to eliminate the virus. Great efforts had been invested in nationwide surveillance, involving hundreds of thousands of volunteers, but great difficulties had been encountered. As in many other countries, officials in Thailand were deeply worried by the possibility of a pandemic, and deeply disturbed by the bleak prospect of access to antiviral drugs and pandemic vaccines. Thailand saw a need to escalate regional cooperation, and had taken a leadership role in that regard. Concerning access to drugs and vaccines, an intensified R&D effort was needed, and WHO could play a leadership role.

Inadequate capacity

Indonesia gave a frank explanation of challenges facing that large and populous country. The poultry sector had four compartments: large industrial farms, medium-sized farms, small farms, and backyard holdings. The first two compartments, which account for 80% of poultry production, lent themselves to protection through strict biosecurity measures. Outbreaks in the other two compartments were more difficult to control. That difficulty was magnified by the scale: around 30 million households maintained small poultry flocks kept in close proximity to people.

Recent political changes, aimed at making the country more democratic and decentralized, had created problems for coordinated action, adding to an already complex and difficult challenge. Many activities had been undertaken and plans were well defined; the country was doing its utmost. An infrastructure, supported by a task force, was in place, but the country had only seven veterinary laboratories, limited human resources, few veterinarians serving local communities, no appropriate regulatory framework, and no properly functioning systems for early reporting at the local level. Control efforts were not easily targeted in the absence of good surveillance. Compensation for culled birds was too low, giving farmers little incentive to report.

Support was needed at many levels, including assistance in implementing poultry vaccination, support for diagnostic laboratories, the provision of personal protective equipment in hospitals, and increased supplies of antiviral drugs. Indonesia fully realized the impact that a pandemic would have on ongoing development projects: they would be ruined. Indonesia had also learnt much from the tsunami experience: donor support must be coordinated, targeted to meet comprehensive needs with little duplication, and managed in ways that did not overburden the affected country.

The problem of inadequate basic capacity was echoed by the Lao People's Democratic Republic and Cambodia. Both were frontline countries, but had little domestic ability to cope with a disease of that nature. Moreover, both countries were fully aware of the need to do everything possible to prevent conditions conducive to a pandemic from arising. Cambodia benefited from the presence of a Pasteur Institute, which provided diagnostic support, but had not been able to determine the

source of exposure for its four confirmed human cases. Those countries urgently needed better surveillance capacity. Informing rural farmers of the risks was another large and urgent challenge.

The importance of political commitment

China reiterated its commitment to the avian influenza problem from the highest level of government and gave an inventory of the comprehensive steps taken to control the disease in animals and prepare for a possible pandemic. Plans, infrastructure, and procedures had been established to take measures from the central to the local levels. Both immediate and longer-term strategies were being followed. Those measures took the form of networks for prevention and control, policies and contingency plans, mechanisms for joint activities in the animal and human sectors, formal budgetary support, and the promotion of scientific research and public awareness.

Surveillance for animal outbreaks and possible human cases had been greatly strengthened. Chinese officials were working closely with the international organizations and immediately reporting important findings. Control measures for animal outbreaks were closely aligned with internationally recommended measures. The country had also developed a national plan for responding to a pandemic.

To intensify surveillance for human cases, a reporting system using hospitals and clinics to detect influenza-like illness had been devised, giving particular attention to the detection of clusters of unusual respiratory disease. Health monitoring of poultry workers was another line of action being undertaken. The country was also prepared to undertake immediate field investigations should human cases occur, and to launch an appropriate emergency response.

China further expressed its desire to take a more active role in international collaboration on avian and pandemic influenza, particularly concerning the development of early warning systems and the need to improve access to pandemic vaccines and antiviral drugs. Regional cooperation, through organizations such as APEC and ASEAN, should likewise be enhanced.

Westward spread of the virus

Beginning in late April 2005, more than 6000 migratory birds died at the Qinghai Lake nature reserve in central China. Tests linked the deaths to infection with the highly pathogenic H5N1 virus. The virus reached the Russian Federation, most likely via birds migrating from Central Asia, in late July 2005. Almost simultaneously, outbreaks were detected, in domestic and wild birds, in adjacent parts of Kazakhstan, and in Mongolia, in wild birds only. From August through October, Mongolia registered the deaths of around 700 wild birds, but no domestic flocks were affected. Having had this close brush with the virus, Mongolia fully appreciated its vulnerability should human cases occur or a pandemic begin. That country lacked adequate veterinary and health infrastructures, and had a weak surveillance system, no antiviral drugs, inadequate personal protective equipment for hospital staff, and no capacity to transfer patients to a central level for care.

Like several other countries, the Russian Federation was presently in response mode, aiming to eliminate the virus from its territory. That task was made difficult by the implication of migratory birds; bird migration was a recurring event, so the threat

from that source would persist. Moreover, the H5N1 virus showed great persistence at cold temperatures; there was a real risk that the virus would remain in the environment during the winter and then erupt in fresh outbreaks when temperatures warmed. In responding to the outbreaks, the Russian Federation had closely followed international technical guidelines for the control of the disease in poultry and the prevention of human cases. Effective surveillance and monitoring systems were in place for high-risk populations. However, Siberia clearly had some hot spots. Regulations had not been consistently adhered to by local authorities, and some hunting practices had been implicated in the recurrence of outbreaks – that was yet another example of how human behaviours can influence the outbreaks. In selecting appropriate control measures, the Russian Federation had looked at the structure of its farming system and the densities of poultry and human populations, particularly in Siberia. The mass slaughter of birds would not always be the most appropriate solution for control.

Romania was one of three European countries, including Turkey and Croatia, to have experienced outbreaks beginning in October 2005. Those, too, were linked to the flight routes of migratory birds. The outbreaks were quickly detected and swiftly dealt with, and had remained largely circumscribed. Like the Russian Federation, Romania had followed international technical guidelines to the letter. Doing so was challenging and costly in terms of the diagnostic support required, culling operations, decontamination measures, systematic monitoring for the virus, protective equipment, and the monitoring and prophylactic care of exposed workers. In the month of October, the country had spent almost US\$ 6 million on that effort.

The European Commission provided an additional perspective on those outbreaks. The European response to avian influenza, it suggested, could serve as a model of a region-wide approach. In that regard, several elements for a successful response were identified: comprehensive, harmonized, and up-to-date legislation (in the form of an EU directive) with compulsory implementation, compliance with international standards, networking of laboratories, shared contingency planning, and a resulting high level of preparedness, which included a readiness to introduce measures aimed at limiting spread. As further precautionary measures, European countries had identified high risk areas, increased surveillance, and intensified biosecurity measures on poultry farms. Strict trade measures were in place to control the international movement of poultry, products, and birds. Special measures, such as the vaccination of zoo birds, had also been undertaken. Moreover, European countries had learnt from experience: devastating outbreaks of highly pathogenic avian influenza (caused by viruses other than H5N1) had occurred in Italy, the Netherlands and, to a lesser extent, Belgium and Germany, and those outbreaks had been successfully controlled. Control efforts had demonstrated the importance of good veterinary infrastructures and services, and Europe was fortunate in that regard. Although it was too early to assess the situation with certainty, European countries probably had a good chance of holding the H5N1 virus at bay and preventing the occurrence of human cases.

Factors supporting successful control

The Netherlands described lessons, measures, and strategies arising from its successful control of an outbreak of highly pathogenic avian influenza, caused by the H7N7 strain, in 2003. That experience showed how very quickly and explosively highly pathogenic avian influenza can spread among farms (detection of the outbreaks within five days was already too late), and how costly its control could

be (more than 30 million birds were lost; culling operations engaged 2,000 workers, and the costs reached around US\$ 300 million). Strategies illustrated the need for a flexible response to a moving target. Control was followed by close monitoring of animal health, with inspection and testing of poultry at four-monthly intervals.

The Netherlands also conducted research in conjunction with the outbreak. In humans, research on exposures and infections detected antibodies in 89 people, indicating recent infection with the virus. Most infections were asymptomatic, some showed mild eye symptoms, but one veterinarian had died. Those infections were thought to arise from the high virus pressure around farms. Research results from studies in animals pointed to the need to know more about how vaccination affected different bird species. Pheasants, for example, were protected from disease, but were still able to shed and spread the virus.

Japan, too, had a success story. Its 2004 outbreak of highly pathogenic H5N1 avian influenza had been controlled and the country was now considered free of the disease, although surveillance – also for H5 and H7 viruses of low pathogenicity – remained intensive. Factors contributing to successful control were strong legislative backing, technical guidelines, a good and well-structured system for diagnostic confirmation and notification, and a control strategy focused on the stamping out of infected and at-risk flocks. Strict controls on the movement of livestock, carcasses, faeces, feed, and equipment were also put in place. A comprehensive veterinary infrastructure was equally important: the country was dotted with some 178 prefectural service centres for livestock hygiene.

Like the Netherlands, Japan had also conducted research in association with the outbreak. Viruses in Japan were found to be close in molecular structure to those isolated during the almost simultaneous outbreak in the Republic of Korea, but no clear epidemiological link between the two outbreaks could be established. Viruses from the Vietnamese and Thai outbreaks showed differences from those in Japan. Such studies could provide important clues about the origins of the outbreaks and the epidemiological behaviour of viruses.

Although capacities in Malaysia did not fully match those in the Netherlands and Japan, that country, too, had successfully controlled its 2004 outbreak of highly pathogenic H5N1 avian influenza. From its experiences following the emergence of the Nipah virus in 1999, also responsible for zoonotic disease, Malaysia fully appreciated the need to launch an urgent response concentrated on early detection, surveillance, and elimination of the virus. Rapid sharing of information was equally important, and an inter-ministerial committee had been established for that purpose. In the “global village” of infectious diseases, where weaknesses in one country could potentially threaten all others, countries needed to be aware of the importance of fundamentally strengthening laboratory capacity as the backbone of efficient disease detection and reporting. The outbreak had been detected promptly, remained small, and lasted about one month. Despite successful control, Malaysia was fully aware of its proximity to the epicentre of virus activity; vigilance and preparedness would remain high, as would efforts to prepare for a pandemic and practice plans.

Africa: the next continent at risk?

Kenya responded to predictions that Africa – a winter stopping place or residence for numerous species of migratory birds – might be the next continent to experience outbreaks. That could be a disaster. Like several other countries in Africa and the

Middle East, Kenya was placed at risk because of its location along the migratory routes of wild waterfowl. The farming situation in Kenya and other parts of Africa had similarities with that in affected Asian countries, meaning that control in birds would be difficult and opportunities for human exposure would be abundant. In rural parts of Africa, chickens usually roamed freely, mixing with wild birds and entering households, where people often sleep in the same room as their poultry. Like other parts of Africa, Kenya's health services were already burdened by the major communicable diseases. In that country, the best coping strategy would be to rely on existing systems for integrated disease surveillance and control. Another possibility was to upgrade the country's two accredited laboratories to a higher biosafety level, thus providing a centre of diagnostic capacity that could serve regional needs.

Priority concerns

Vaccination policy for animals

Several participants raised questions about the appropriate use of animal vaccines as part of the overall control strategy. One problem arose from the fact that not all vaccines currently in use were quality assured, and not all were being used in line with recommendations from the technical agencies. Manufacturing capacity was not a problem: production could easily and rapidly double. Questions were raised about vaccine efficacy, different responses to vaccination in different bird species, and the difficulty of conducting surveillance for persistence of the virus when most birds had been vaccinated. As FAO and OIE explained, vaccination should be considered as one component of control, within a constellation of measures, suitable for use under precisely defined situations, and never in isolation. Culling, according to FAO and OIE recommendations, remained the preferred control measure. Should that first line of defence fail, vaccination could then be considered in an at-risk area, in line with recommendations from the technical agencies.

Based on its experience in the successful control of highly pathogenic H5N1 avian influenza, Japan mentioned two problems that could arise from the use of vaccination as a central control strategy: it hindered serum antibody testing and thus complicated surveillance for the disease, and it influenced a country's disease-free status. While culling was regarded as more effective than vaccination, should the disease emerge on many farms, then vaccination could be considered. The Russian Federation, which had experienced outbreaks in sparsely populated parts of Siberia, pointed to the need to stratify the problem according to farming situations and structures in individual countries; nature could not forever condone the slaughtering of millions of birds. For birds, the task of control could be differentiated at three levels. For wild birds, control was not feasible. For household and backyard flocks, vaccination could work as a strategy for reducing the level of infection. For large commercial farms, the best way to ensure protection and safety would be through implementation of strict biosecurity measures. FAO and OIE agreed that such a strategy, of combining vaccination and biosecurity in line with the farming structure within an individual country, was exactly right.

Further spread of the virus

Many countries, not yet affected, acknowledged their vulnerability, especially to spread of the virus via migratory birds. Several described ministerial meetings and region-wide planning sessions that had taken place to raise awareness and work out a shared mechanism for surveillance and response. Better information on countries placed at risk by migratory birds was urgently needed. In the past, pandemics had consistently announced themselves with an abrupt explosion of cases, giving the world no advance warning. Now, in the climate of high alert created by several warning signals, countries needed a more precise idea of their level of risk so that preparedness plans could be geared up accordingly.

During those discussions, the particular vulnerability of parts of Africa to avian influenza became apparent and emerged as a matter of great concern. Large parts of Africa lay along the flyways of migratory birds, some of which spent the winter in the southern part of the continent. The risk that the H5N1 virus might be introduced to Africa was considered great. The continent had an estimated 1.1 billion chickens,

mostly produced in backyard farming systems. Mass culling would be extremely difficult to accomplish in the African village setting. Resources were not available to compensate farmers or pay for animal vaccines. Traditional practices, exacerbated by rural poverty, favoured the home slaughter and consumption of birds when signs of illness appeared in a flock. Veterinary services in large parts of Africa had deteriorated greatly in recent decades, and health systems were overburdened by AIDS, tuberculosis, malaria, and other diseases. While every country had at least some veterinary services, few extended to rural areas. Much of the continent lacked adequate infrastructure, logistics, diagnostic capacity, and well-trained staff. With international support, some surveillance systems for animal diseases were in place and had witnessed some success stories, but those operated in only 30 of 53 countries. No early warning system specific to avian influenza – in animals or humans – was presently in place.

Under such circumstances, a real risk existed that the virus could become endemic in birds even before outbreaks were detected and reported. Moreover, of all parts of the world, Africa was considered probably the least able to cope with the abrupt and extreme challenges of a pandemic. As one participant asked: what would the international community do if an emergency situation arose in Africa, especially when the window of opportunity for preventing further evolution of the virus or delaying international spread of a pandemic strain was measured in days? That question had no ready answer. Another participant pointed to the need to consider how loss of a prime source of protein from household poultry flocks would influence nutritional status, particularly of children.

Access to vaccines and antiviral drugs

For human health, viewed against the looming threat of a pandemic, the greatest concern of many participants centred on the issue of adequate supplies and equitable access to pandemic vaccines and antiviral drugs – the two most important medical interventions for mitigating morbidity and mortality during a pandemic. Participants readily agreed that vaccines would provide the first line of defence, and that antiviral drugs would have an important supporting role, particularly at the start of a pandemic, when no country would have sufficient vaccine supplies. Having accepted the vital role of vaccines, several countries expressed dismay at the discordance between current manufacturing capacity and the demand during a pandemic, and between the investment needed to protect entire populations and the ability of many countries to pay.

Present worldwide manufacturing capacity for trivalent seasonal vaccines (effective against two circulating strains of influenza A virus and one of influenza B virus) was recently estimated to be around 420 million doses per year. That capacity would fall far short of the demand during a pandemic, but could not be either easily or rapidly expanded. Increased use of vaccines for seasonal influenza, in line with WHO targets, was put forward as the surest and most sustainable way to increase manufacturing capacity, as the same facilities were used to produce pandemic vaccines. During the meeting, many countries reported impressive progress in reaching the WHO targets set for population coverage with seasonal vaccines. However, the resulting expansion in manufacturing capacity was gradual and still inadequate. It could not be known with certainty whether the behaviour of the H5N1 virus would allow time for gradual improvements in capacity.

Around eight companies were presently working on the development of a vaccine effective against an H5N1-like pandemic virus. Work was under way to expand the number of doses of vaccine through “smart” strategies for vaccine composition. Those involved ways to spare antigen (the component of the vaccine that elicits the immune response) and boost the immune response through inclusion of an adjuvant in the vaccine formulation. On present evidence, strategies that economized on the use of antigen were expected to work; those could allow the production of 900 million doses within around eight months following the emergence of a pandemic virus. Laboratories within the WHO network could produce a prototype virus strain for use in vaccine production within three weeks; that prototype virus would be distributed by WHO to interested companies on request. Each day gained would be valuable, as it could allow manufacturers to produce around 4 million doses more of a pandemic vaccine. Nonetheless, a significant increase in manufacturing capacity would take 4 to 5 years to achieve.

Similar problems surrounded the availability of antiviral drugs, where efforts to stockpile supplies in advance were being undertaken almost exclusively by wealthy countries, earmarking finite supplies. As some noted, the greatest financial investment in pandemic preparedness to date had gone to the building up of such domestic stockpiles. In affected countries, as surveillance and awareness improved, the detection of more human cases could be expected, and that went hand in hand with a need for more drugs to treat patients and offer prophylaxis to contacts and health care workers. Where was the guarantee, in the best interests of the international community, that supplies of antiviral drugs would be available when and where they were needed first? Could the world continue to allow the availability of those drugs to be determined on the present first-come, first-served basis mainly pertaining to affluent nations?

At the same time, however, it was acknowledged that antiviral drugs were not a “silver bullet”, and that the response to the current crisis and that arising from a pandemic would require a constellation of well-planned measures. Experience with other diseases also made it clear that reliance on the presently very limited number of antiviral drugs was unwise.

While the number of countries with pandemic preparedness plans had jumped from less than 50 six months ago to around 120 presently, those plans could not be truly effective in mitigating the impact of a pandemic so long as prospects for acquiring vaccines and antiviral drugs remained so bleak. Countries were finding it hard to craft good pandemic response plans when they could not count on having those interventions. As some countries had noted, media coverage of stockpiling of antiviral drugs in wealthy countries had caused anxiety among the public in less-fortunate countries, creating expectations and demands on governments that could not, at present, be met. Moreover, in countries with constrained budgets for health, purchase of those drugs ahead of an uncertain pandemic created an ethical dilemma: investment in interventions that might never be used or that expired before use would take place at the expense of existing priority diseases with well-documented and immediate consequences. An urgent quest for solutions to such undeniably difficult problems was put forward as a top priority for the international community. WHO, it was recalled, had a long history of work aimed at improving access to essential medicines; it would be logical for WHO to take a lead role in that endeavour as well.

Risk communication

All agreed on the importance of risk communication. In the present situation, populations in affected countries needed to be made more aware of the disease, the importance of reporting illness and deaths in poultry, and the human behaviours associated with a high risk of infection. Should avian influenza arrive in a continent such as Africa, risk communication, reaching to rural areas, might be the most effective preventive and protective intervention.

Accurate and timely information would also be vitally important during a pandemic, when human behaviours were likely to influence the operational environment as much as the behaviour of the pandemic virus. Moreover, as the financial institutions noted, the most immediate social and economic impact of a pandemic would likely arise from the uncoordinated efforts of the public to avoid becoming infected. Countries with a strong track record of credibility, of honest and timely disclosure of information, would probably be best-positioned to mitigate the damage caused by panic reactions, as such government policies instilled public confidence. For its part, WHO would be monitoring the evolving pandemic situation in real time, in collaboration with virtual networks of scientists and clinicians, and would issue situation updates on its website. That information would help health authorities to select the most appropriate non-pharmaceutical interventions for minimizing national and international spread, and communicate risks and protective behaviours to the public.

Opportunities as well as challenges

Although the overall picture was certainly a grim one, some participants called for a look at the opportunities as well as the challenges. Two main opportunities were identified. First, health concerns could help to bridge political differences. Under a shared threat from the virus, some countries in geographical areas long divided by tense political differences had begun to collaborate in mapping out region-wide preparedness and response measures. That collaboration should continue.

Second, concern about the threats from avian influenza and a human pandemic had put the spotlight on a long-neglected problem: the fact that weak surveillance and response capacities anywhere endangered the world's collective ability to defend itself against the infectious disease threat. All countries were part of the chain that formed the international early warning system, the net that gathered disease intelligence. The present crisis had brought gaps and inadequacies in the infrastructures and capacities of many countries into sharp relief. Issues and needs long looming in the background had been moved to centre stage. The present determination to defend the world against the avian influenza and pandemic influenza threats was thus an opportunity to strengthen fundamental capacities, in both the animal and human sectors, in ways that would lead to increased security against the emerging disease threat for all countries.

Guiding principles for taking action

In a spirit of determination to find solutions and get results, guidance was sought from a diversity of sources: the SARS experience, lessons from the Asian tsunami, and recent international agreements on the most effective forms of aid.¹ Agreement was reached on several principles that should guide the emergency response to the present situation and shape planning for a pandemic. Solutions must be expedient. Needs, gaps, and overlaps should be identified, and that exercise should form the basis for defining priority actions. The most important job at present was to identify priority needs, gather resources, and get results. In doing so, a distinction should be made between technical and institutional gaps and policy gaps. Information exchange at all levels – from the laboratory to the field, and from the agricultural to the public health sector – was essential, and formal mechanisms should be established for that purpose. Shared activities in the human health and agricultural sectors should be identified, and efforts should be made to ensure those worked in tandem.

Expedient solutions for immediate and longer-term needs

Participants acknowledged the need to follow, in a united way, the technical guidelines and standards set out by the international agencies. The main challenge would reside in helping countries build the capacity to comply with those guidelines and standards. No duplication of efforts could be afforded in the present situation. The use of existing mechanisms and infrastructures, strengthened and adapted to the avian influenza situation, was regarded as the most expedient way to improve capacity for responding to both outbreaks in poultry and sporadic human cases. For example, laboratories in the WHO and FAO/OIE surveillance networks were already providing substantial diagnostic support, and the geographical reach of those networks could be expanded. Similarly, existing region-wide approaches, whether for integrated disease surveillance in Africa or economic collaboration in Asia, were considered the most efficient vehicle for a streamlined response to the overlapping needs of neighbouring countries. The Americas, too, benefited from several strong regional and sub-regional initiatives, and those were already being used to prepare for avian and pandemic influenza. Region-wide approaches might also be the best option for the stockpiling of emergency medical and other supplies as part of pandemic preparedness. In terms of planning national responses to a pandemic, countries with limited resources could adapt existing plans for responding to natural disasters.

Participants stressed the need to look for both emergency solutions to the present crisis and longer-term ways to strengthen fundamental capacity. That approach was especially relevant for surveillance, alert, and response capacity – the H5N1 virus would not be the last health menace to arise from the animal world, nor was it the only influenza virus with pandemic potential. Improved capacity to detect and contain emerging diseases of humans and animals was regarded as a universal good that would strengthen collective health security. In a highly mobile, interdependent, and closely interconnected world, diseases and the panic they might incite could spread with exceptional speed to all countries, amplifying social and economic disruption far beyond the affected areas. Such consequences would undoubtedly be greatest during an influenza pandemic, when all parts of the world would be affected within a matter of months.

¹ Particular reference was made to the [Paris Declaration on Aid Effectiveness](#).

The importance of integrated country programmes

Participants endorsed the principle of integrated country-owned programmes as a basis for intervention at the country level, and agreed that donors should support the same programmes, based on guidance provided by the technical agencies. In such integrated programmes, animal and human health issues should be dealt with as a coherent whole. Participants from developing countries repeatedly emphasized the need to minimize donor demands on scarce country capacity, thus further underscoring the critical importance of coordinated support to country programmes.

Collaboration and coordination

Participants agreed on the need to draw support from all financial sources. Those were identified as including continued technical assistance from FAO, OIE, and WHO, a strong flow of bilateral donor and EC grants, and multilateral assistance from development banks. Support could also come in the form of resources and expertise from the private sector, nongovernmental organizations, and foundations. Bringing together these potential contributors of support would require effective coordination. While many participants agreed that a multi-donor trust fund had a role to play, they stressed the need to avoid creating new institutions and to keep coordinating arrangements as light as possible, at a reasonably high level. Such an approach would seek to coordinate a range of different funding mechanisms in a way that covered identified needs and minimized funding overlaps. It would also provide a periodic check on progress and a forum for agreeing on changes in the overall funding levels and architecture, if needed.

Participants welcomed the UN's recent appointment of a senior system-wide coordinator for avian and human influenza. Needs within individual countries varied greatly; solutions to needs should be tailor-made, yet still closely fitted to UN guidelines, standards, and norms. For the UN system, the challenge was to find ways to do more to meet agreed needs in the areas of prevention and containment, surveillance, research and development, risk communication, and pandemic preparedness.

Guidance and support were needed to choose the right interventions and to strengthen technical and institutional capacities. The combined support from the UN system, resident coordinators within countries, and many other humanitarian and development agencies would be needed. Numerous nongovernmental organizations had considerable experience in well-defined and relevant areas, and that experience would surely be called upon should a pandemic virus emerge. Several specific offers of support from nongovernmental organizations – from on-the-ground surveillance in the present situation to assistance with logistics and food supplies during a pandemic – were made during the meeting. Nongovernmental organizations also stressed the need to ensure that especially vulnerable groups, including refugees and migrant groups, were included in preparedness plans.

Immediate resource needs

Estimates from the co-sponsoring agencies pointed to an urgent need for investments at national level – potentially reaching US\$ 1 billion over the next three years. An additional US\$ 35 million was needed immediately to support high priority actions, at the international level, by the technical agencies over the next six months.

Opportunities to intervene

Control the virus at source

Participants agreed that control of the H5N1 virus at source – in poultry – was the best way to reduce, or possibly even eliminate, the current pandemic risk. The task was feasible, but would require considerable effort and substantial investment. No technical barriers stood in the way of success. An agreed global strategy for progressive control of avian influenza was available and had been tested, and the same was true for technical standards and norms. Operational support was likewise available from FAO and OIE and diagnostic support was being provided by their joint OFFLU network of reference laboratories specialized in work on avian influenza viruses in animals. Experiences in several countries, including Japan and the Netherlands, had demonstrated the feasibility of control, provided investments and infrastructures were sufficient and measures were undertaken with appropriate speed.

Strategies, technical guidelines, and internationally agreed norms and standards were available from FAO and OIE to guide control. They covered the full range of control measures, from biosecurity on large farms and restrictions on the international movement of animals and products, to humane culling, quarantine, disinfection, and the prudent use of vaccination. Standards, issued by OIE, were in place to guide surveillance, diagnostic methods, and vaccine quality. Moreover, mechanisms for the coordinated implementation of those strategies were also available, a prime example being the joint FAO/OIE Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TAD). That initiative used a regional approach, backed by support units of epidemiologists, to provide expert advice, operational support, and an early warning system.

Behavioural change, too, could reduce human exposures and infections and thus shrink opportunities for the H5N1 virus to improve its pandemic potential. Better risk communication, capable of reaching and convincing rural populations who may have low levels of literacy, was considered essential. Frank and transparent reporting of the situation in affected countries was equally essential; governments had a duty to give their citizens the information they needed to adopt protective behaviours.

Participants from some severely affected countries expressed an explicit need for financial support for compensation schemes for farmers and for the vaccination of large numbers of birds. Both activities were vital to control, but costly and beyond the reach of many countries. In particular, compensation of farmers was identified as a strategy that would relieve the economic burden on small farmers, improve compliance with control measures, and encourage the spontaneous reporting of outbreaks. By giving a better picture of the “hot spots” of animal disease, it would also help target surveillance for human cases.

Surveillance, transparent reporting, and containment

All agreed on the need, as a matter of great urgency, to strengthen surveillance, detection, reporting, and containment. Without such improvements, warning signals near the start of a pandemic would be missed, as would opportunities to intervene early in the interest of all countries. Early and transparent reporting could spell the difference between success and failure. Governments should regard transparent reporting as a duty, both to help citizens know the risks and adopt appropriate

behaviours and to allow WHO and the international community to perform an accurate risk assessment.

Several affected and at-risk countries had made specific requests for assistance in upgrading diagnostic capacity and improving their proficiency in performing recommended confirmatory tests; diagnostic confirmation of H5 infection was known to be technically difficult and could be safely performed only at a high level of biosafety. Those requests should receive priority. As each additional human case gave the virus an opportunity to improve its transmissibility, field investigations of all new cases were of the utmost importance, as were measures aimed at tracing and monitoring contacts and protecting health care workers from infection. Clear information about the evolving epidemiological situation was also essential to allow WHO to declare the right level of pandemic alert, which, in turn, would trigger a defined series of national and international response measures.

Contain the emerging pandemic virus

Sensitive surveillance and rapid reporting were considered important for other reasons as well. Following an industry donation, WHO would have a rapid-response stockpile of antiviral drugs, amounting to 3 million treatment courses, by early 2006. Drugs in the stockpile were strictly reserved for use following the first signs that the virus might be improving its transmissibility among humans. Mathematical models had suggested that rapid prophylactic treatment of the initially affected population, combined with restrictions on movement in and out of the area, might halt further evolution of the virus or at least delay its international spread. Each day gained could mean almost 4 million more doses of vaccine, while also allowing emergency services to gear up for the anticipated surge in cases of illness and deaths. The window of opportunity for successful intervention had been estimated at only around three weeks following symptom onset in the first people infected with an emerging pandemic virus.

Though appealing, participants noted that such a strategy had never been tested – the world had never before received an advance warning that a pandemic might be imminent. The success of the strategy depended on several assumptions, some concerning the behaviour of the pandemic virus and the conditions surrounding its emergence. Excellent surveillance and logistics capacities in the initially affected areas, combined with an ability to enforce movement restrictions, were fundamental to success. Everything possible must be done to give the strategy the best chances of success, as it would probably represent the last opportunity for the international community to forestall a pandemic or delay its international spread.

Increase pandemic preparedness

The planning of national responses during a pandemic was regarded as an activity that all countries could and should undertake immediately. Few – if any – countries were in a position to claim that they were adequately prepared for a pandemic. The situation was, however, improving. As noted by WHO, the number of countries with pandemic plans had grown from fewer than 50 just six months ago to more than 120 at present. During the meeting, numerous countries reported on the status of preparedness plans. Some had already been rehearsed in desk-top exercises; others were scheduled for region-wide testing over the coming weeks and months. However, on that issue, many participants repeated what may have been one of the meeting's greatest concerns: lack of assured access to vaccines and antiviral drugs remained a critical stumbling block in efforts to craft adequate response plans.

Ways and means

For some of the problems identified, rapid and adequate funding could result in an immediate step forward. For example, adequate compensation to farmers for lost birds would relieve an economic burden for large numbers of rural farmers while also improving reporting in ways that bolstered fragile surveillance systems and helped compensate for inadequate veterinary out-reach services. For other problems, most notably equitable access to sufficient supplies of vaccines and antiviral drugs, the issues were complex and multidimensional. Their solution, which should be made a top priority, would require new and creative ideas, innovative research and development, and support from public-private partnerships.

To date, countries with limited resources had been the most severely affected by poultry outbreaks, and those countries had also been the ones reporting human cases. Efforts to prevent a pandemic virus from emerging would need to be focused there. Unfortunately, those countries also had the least capacity to detect human cases and pick up the first epidemiological signals that the virus might be improving its transmissibility among humans. A three-step process was identified for addressing that critical problem. First, look to countries to identify specific needs and the associated financing gaps. Second, look to the international agencies for technical guidance on meeting those needs. Third, look to the international community for the financial assistance needed to fill those gaps. Some participants suggested that improved capacity for early detection should be given the highest immediate priority.

As several participants noted, the bulk of resources for pandemic preparedness had gone, to date, to the stockpiling of antiviral drugs in wealthy countries. The meeting produced strong signals that that unbalanced situation would change. To tackle present and future problems arising from avian influenza and the pandemic threat, financial institutions agreed that large amounts of money would need to be disbursed quickly. All concerned – governments in affected and at-risk countries, donors, financial institutions, and the international agencies – should remember their responsibilities and obligations and be aware that they will be held accountable for their performance. Interventions proposed for funding should be aligned with guidelines, norms and standards issued by the relevant international technical agencies.

As some noted, pledging implied decision-making, and that must be done quickly, based on good plans and reliable information. The meeting benefited from the presence of development banks serving Asia, Africa, and the Americas. Those multilateral institutions were fully aware of the magnitude of the threat and its immediate and potential financial implications; all had readied themselves with high-level planning, which included an appreciation of the need to disburse funds in fast-track ways. In making funding decisions, banks would be guided by their own demonstrated strengths as well as by the expressed needs of countries.

While many affected countries had already invested considerable funds in responding to the crisis, international resources would be needed to fill domestic gaps, and it was up to governments to identify those gaps. Integrated country plans were the foundation; the preparation of country plans was a basic task for which responsibility rested with governments. Government leadership was further needed to set priorities and establish ownership of funded projects. Country plans should specify needs and associated costs for short, medium, and longer term

improvements. Ideally, projects would tackle short-term emergency needs with solutions that provided a longer-term strengthening of institutional capacity.

Funding agencies should provide needs-based support to integrated country programmes, delivered in a coordinated and harmonized way, and continually monitor and refine the process. Funding mechanisms needed to be flexible, with easy disbursement, and not hampered by bureaucratic delays. Some financial institutions stated their readiness to forego the lengthy procedures normally required for project approval in view of the exceptional nature of the present threat. Donors would also need to find ways to reduce transaction costs, and ensure transparent and predictable funding. Participants readily agreed that funds already allocated to other priority activities should not be diverted. The international community must keep in mind its existing commitments to agreed objectives, such as sustainable development and poverty alleviation.

For their part, some countries asked funding agencies to appreciate the difficulty of devising accurate, reliable, and robust plans and needs assessments in a situation fraught with uncertainty and prone to rapid evolution. The donor community should also appreciate the gap between plans, based on needs, and the actual capacity of countries to implement them. Funding agencies would need to act quickly and flexibly to equip countries to respond as planned. Moreover, as the most damaging threat – that of a pandemic – was still in the offing, some countries faced a need to gather stronger domestic political and financial support for what was, at present, a remote health threat competing with many other immediate ones.

Suggested concrete actions

During the three days of discussions, many proposals were made for addressing the issues of greatest concern. While some priority concerns were especially complex and would require the high-level engagement of multiple sectors, the proposals for addressing them immediately were all straightforward.

The *International Health Regulations* (2005) – the only internationally-agreed legal instrument governing the response to infectious diseases of international concern – had recently been revised and greatly strengthened, making it an appropriate instrument for use under the unique conditions of the 21st century. Many participants asked that a procedure for immediate voluntary compliance with relevant provisions in the revised regulations be worked out and put forward for consideration by the WHO Executive Board at its meeting in January 2006. That proposal was accepted.

As rapid intervention using the WHO stockpile of antiviral drugs would probably be the last opportunity to forestall a pandemic or delay its international spread, several participants saw a need to do everything possible – immediately – to give that intervention the best chances of success. A proposal was made for a small group of experts to work out a detailed operational protocol. The protocol should include a definition of efficient human-to-human transmission (the epidemiological trigger for intervention), supported by detailed operational plans. That proposal, too, was welcomed.

To identify countries at greatest risk of outbreaks in wild birds or poultry, research on the role of migratory birds in spreading the virus was urgently needed. A better understanding of that role would ideally yield precise information on the species involved, their exact migratory routes, and the timing of their anticipated arrival in different parts of the world. Such information, which could be mapped, would give countries advance warning and help them devise protective measures targeted at wetland areas at greatest risk. Advance warning, supported by appropriate surveillance and a swift response, could help reduce the risk that the virus would establish endemicity in even larger geographical areas.

Equitable access to vaccines and antiviral drugs should be viewed as a shared responsibility of all countries. To address this complex problem, proposals were made to establish an expert group tasked to explore all avenues and issues. Those could include support from public-private partnerships with industry, pre-qualification of manufacturers, the engagement of foundations, technology transfer, better use of untapped manufacturing capacity in the developing world, and consideration of relevant articles from the TRIPS agreement and the Doha Declaration. For antiviral drugs, licensing, storage, liability, and prescribing issues should also be addressed. It was suggested that WHO could provide the technical framework for uniting science, industry, and the public sector in that complex task.

Calls for coordinated action were numerous, as were proposals for achieving that goal. To tap all sources of field support, an inventory should be developed showing agencies and ongoing initiatives, including those undertaken by nongovernmental organizations, that could be quickly called on to support work on the control of avian influenza or contribute to the response during a pandemic. A budget matrix should be produced, for affected and at-risk countries, to capture all support

provided or pledged to date. Such a matrix could help ensure that comprehensive needs, identified by the country, were met, while also reducing duplications. It could also contribute to the frequently voiced need for coordination among donors. As yet another proposal, country plans could be placed on a website. Apart from meeting the need for transparency, easy access to country plans could likewise contribute to a coordinated and comprehensive response to the priority needs identified by countries. Timeframes for improving institutional capacity within countries would be another innovation useful in formulating country plans that met longer-term objectives as well as emergency needs.

As another – and most welcome – recognition of the importance of advance planning and coordinated action, Switzerland announced during the meeting that it was working out measures to ensure that WHO and other international agencies housed in its territory would be able to function properly under the disruptive conditions of a pandemic.

The importance of strong laboratory diagnostic capacity as a support to outbreak detection and investigation was repeatedly emphasized. Greater proficiency in the use of recommended confirmatory tests was equally important. Such capacity underpinned any call to improve global surveillance and gather rapid and reliable disease intelligence. Proposals were made to expand the number and geographical reach of laboratories in networks maintained by the international agencies. However, as pointed out by WHO, network laboratories must meet stringent and robust requirements, as inclusion in the network carried a set of obligations and duties, and all laboratories must have the capacity to perform as expected. During the meeting, France announced its intention to strengthen its network of Pasteur Institutes and other technical networks in Asia and Africa. As Pasteur Institutes in Asia had already provided a backbone of diagnostic support for both poultry outbreaks and human cases, that announcement provided especially welcome and reassuring news.

Finally, many participants looked for ways to build on the strong momentum to take action that had become apparent during the meeting. To move the agenda forward, China offered to host a follow-up pledging meeting in Beijing in January 2006. That offer was accepted by participants with warm appreciation.

Main conclusions and recommended actions

Ten conclusions and twelve precise recommendations for integrated action emerged during the meeting, and these were set out by the Director-General of WHO in his closing remarks. As he noted, the recommended actions would be undertaken immediately.

Conclusions

1. Minimizing the threat at source to both animal and human populations through rapid reduction of the viral burden of H5N1 is essential. This entails timely notification of outbreaks in birds, poultry culling and vaccination as indicated, including "backyard" flocks, and provision of appropriate compensation for farmers.
2. "Early warning" and surveillance systems for animal and human influenza are critical to effective response. The current window of opportunity to intervene is measured in days. Transparent and immediate reporting is essential.
3. The introduction of avian infection with H5N1 to other countries is predicted, following the patterns of migratory birds, and as a result of production systems and market practices. Other strains of avian flu are also an ongoing and emerging threat and must be monitored. Strengthened veterinary services are a crucial aspect of detection and response. Open sharing of virus samples is essential. Quality assured animal vaccines produced to international standards should be used in healthy poultry when appropriate.
4. At present many governments are not ready to cope with outbreaks, still less a pandemic. Preparedness is vital in every country, in every Region. Integrated country plans will build on and strengthen existing systems and mechanisms. They will be comprehensive, costed, and evaluated. Response mechanisms should be rehearsed through simulation exercises. These plans will include protection of vulnerable groups such as children, refugees and displaced populations.
5. Resources needed to slow down or contain the emergence of a pandemic are insufficient. Supplies of antiviral drugs currently do not meet potential demand. Issues remain of equitable access to medicines and deployment of stockpiles.
6. A universal non-specific pandemic vaccine may be the ultimate protective solution for human influenza. "Smart" solutions are being investigated. Issues of technology transfer, resolution of licensing and regulatory obstacles, sustained use of good manufacturing practices and pre-qualification are under discussion. Predictable, increased orders for seasonal flu vaccine will support greater manufacturing capacity, including in developing countries.
7. Communications. The recent series of high-level meetings on avian influenza and human pandemic influenza have successfully created a shared agenda. The public needs clear, regular, reliable information. Civil society, nongovernmental organizations and other community groups must be involved.
8. A rich array of resources is potentially available to support government and institutional efforts. Countries that have successfully controlled outbreaks of avian influenza are prepared to help others.

9. Mechanisms for donor support are in place. There is broad commitment to minimize transaction costs of international support through alignment and harmonization. International support to country plans should supplement national resources, as well as existing donor resources, and should target resource-poor countries.
10. Investments are urgently needed at national level – potentially reaching 1 billion dollars over the next three years. An additional 35 million dollars is needed immediately to support high priority actions by technical agencies at the global level over the next six months.

Recommended actions

1. Support the development of integrated national plans for avian influenza control and human pandemic influenza preparedness and response.
2. Assist countries in aggressive control of avian influenza in birds, and deepen the understanding of the role of wild birds in virus transmission.
3. Nominate "rapid response" teams of experts to support epidemiological field investigations.
4. Strengthen country and regional capacity in surveillance, laboratory diagnosis, and alert and response systems.
5. Expand the network of influenza laboratories, with regional collaborative systems for access to reference laboratories.
6. Establish and integrate multi-country networks for the control or prevention of animal trans-boundary diseases, and regional support units as established in the Global Framework for the Progressive Control of Trans-boundary Animal Diseases.
7. Expand the global antiviral stockpile, and prepare standard operating practices for its rapid deployment to achieve early containment.
8. Assess the needs and strengthen veterinary infrastructure in line with OIE standards.
9. Map out a global strategy and work plan for coordinating antiviral and influenza vaccine research and development, and for increasing production capacity and equitable access.
10. Put forward proposals to the WHO Executive Board at its 117th meeting for immediate voluntary compliance with relevant articles of the International Health Regulations 2005.
11. Finalize detailed costing of country plans and the regional and global requirements to support them, in preparation for the January pledging meeting to be hosted by the Government of China.
12. Finalize a coordination framework building on existing mechanisms at the country level, and at the global level, building on international best practices.

Agenda, list of participants

The final agenda for the meeting can be accessed at the following site:

http://www.who.int/mediacentre/events/2005/Flu_meeting_Final_agenda_Nov05.pdf

The list of participants can be accessed at the following site:

http://www.who.int/mediacentre/events/2005/avian_influenza/LOP_AvianInfluenza2.pdf